WE CLAIM:

1. A method for fabricating high light extraction photonic devices, comprising:

growing an epitaxial semiconductor device structure on a substrate, said epitaxial semiconductor structure and substrate comprising an emitter adapted to emit light in response to a bias;

flip-chip mounting said emitter on a submount such that said epitaxial semiconductor device structure is sandwiched between said submount and said substrate, and

etching said substrate off said epitaxial semiconductor device by utilizing an etch environment that etches said substrate substantially faster than said epitaxial semiconductor structure.

2. The method of Claim 1, wherein said epitaxial semiconductor structure comprises a Group-III nitride semiconductor material.

3. The method of Claim 1, wherein said substrate comprises a monocrystaline material.

4. The method of Claim 1, wherein said substrate comprises monocrystaline silicon carbide (SiC).

5. The method of Claim 1, wherein said etch environment comprises a reactive ion etch.

6. The method of Claim 1, wherein said etch environment comprises nitrogen trifluoride (NF_3).

7. The method of Claim 1, further comprising depositing a first mirror layer on said epitaxial semiconductor structure opposite said substrate structure prior to said flip chip mounting of said emitter, said mirror sandwiched between said epitaxial semiconductor structure and said submount after said flip chip mounting.

8. The method of Claim 7, wherein said first mirror layer comprises a reflective metal.

9. The method of Claim 7, wherein said first mirror layer comprises a distributed Bragg reflector (DBR) comprising a plurality of alternating layer pairs of dielectric material.

10. The method of Claim 9, wherein each of said layer pairs comprise a layer of silicon dioxide (SiO_2) and a layer titanium dioxide (TiO_2), or a layer of silicon dioxide (SiO_2) and a layer of tantalum pentoxide (Ta_2O_5), the thickness of said pairs of layers equally a approximately a quarter of said wavelength of said emitted light.

11. The method of Claim 9, wherein said layer pairs repeat two to four times.

12. The method of Claim 7, wherein said first mirror layer comprises an epitaxial DBR comprising a plurality of alternating layer pairs of epitaxial material.

13. The method of Claim 12, wherein each of said alternating layer pairs comprises a layer of gallium nitride (GaN) and a layer of aluminum nitride (AlN), or a layer of gallium nitride (GaN) and layer of an alloy of aluminum nitride (Al_zX_yN), said alternating layer pairs having a thickness approximately equal to a quarter of said wavelength of said emitted light.

14. The method of Claim 12, wherein said pairs of layers repeats eight to twelve times.

15. The method of Claim 1, wherein said submount comprises one of the group consisting of monocrystaline silicon carbide (SiC), a silicon substrate and glass.

16. The method of Claim 1, further comprising depositing a second mirror layer on said epitaxial semiconductor structure after said substrate has been etched, said second mirror layer arranged such that said epitaxial semiconductor structure is sandwiched between said submount and said second mirror layer.

17. The method of Claim 16, wherein said second mirror layer comprises a reflective metal.

18. The method of Claim 16, wherein said second mirror layer comprises a distributed Bragg reflector (DBR)

comprising a plurality of alternating layer pairs of dielectric material.

19. The method of Claim 18, wherein each of said layer pairs comprise a layer of silicon dioxide (SiO_2) and a layer titanium dioxide (TiO_2), or a layer of silicon dioxide (SiO_2) and a layer of tantalum pentoxide (Ta_2O_5), the thickness of said layer pairs equal to approximately a quarter of said wavelength of said emitted light.

20. The method of Claim 18, wherein said layer pairs repeat two to four times.

21. The method of Claim 16, wherein said second mirror layer comprises an epitaxial DBR comprising a plurality of alternating layer pairs of epitaxial material.

22. The method of Claim 21, wherein each of said alternating layer pairs comprises a layer of gallium nitride (GaN) and a layer of aluminum nitride (AlN), or a layer of gallium nitride (GaN) and layer of an alloy of aluminum nitride (Al_zX_yN), said alternating layer pairs having a thickness approximately equal to a quarter of said wavelength of said emitted light.

23. The method of Claim 21, wherein said pairs of layers repeats eight to twelve times.

24. The method of Claim 1, wherein growing an epitaxial semiconducting structure comprises:

growing a first epitaxial semiconductor layer on said substrate, and

growing a second epitaxial semiconductor layer on said first epitaxial semiconductor layer, such that said first semiconductor layer is sandwiched between said substrate and said second semiconductor layer.

25. The method of Claim 24, wherein growing an epitaxial semiconducting structure comprises growing thin doped layers and forming a resonant cavity light emitting diode.

26. A method for fabricating high light extraction photonic devices, comprising:

growing an epitaxial semiconductor structure on a substrate;

depositing a first mirror layer on said epitaxial semiconductor structure such that said epitaxial semiconductor structure is sandwiched between said first mirror layer and said substrate;

removing said substrate from said epitaxial structure by introducing an etch environment to said substrate; and

depositing a second mirror layer on said epitaxial semiconductor structure such that said epitaxial semiconductor structure is sandwiched between said first and second mirror layers.

27. The method of claim 26, wherein said etch environment etches said substrate substantially faster than said epitaxial semiconducting structure, etching off

substantially all of said substrate without etching off substantially any of said epitaxial semiconducting structure.

28. The method of claim 26, wherein said epitaxial semiconductor structure is adapted to emit light in response to an electrical signal.

29. The method of Claim 26, wherein said epitaxial semiconductor structure comprises a Group III nitride semiconductor material.

30. The method of Claim 26, wherein said substrate comprises monocrystaline silicon carbide (SiC).

31. The method of Claim 26, wherein said etch environment comprises a reactive ion etch.

32. The method of Claim 26, wherein said etch environment comprises nitrogen trifluoride (NF_3).

33. The method of Claim 26, wherein either of said first or second mirror layers comprise a reflective metal.

34. The method of Claim 26, wherein said either first or second mirror layer comprise distributed Bragg reflector (DBR) mirror having alternating layer pairs of dielectric material.

35. The method of Claim 34, wherein each of said layer pairs comprise a layer of silicon dioxide (SiO_2) and a

layer titanium dioxide (TiO_2), or a layer of silicon dioxide (SiO_2) and a layer of tantalum pentoxide (Ta_2O_5).

36. The method of Claim 26, wherein either of said first or second mirror layers comprise an epitaxial DBR mirror alternating layer pairs of epitaxial material.

37. The method of Claim 36, wherein each of said alternating layer pairs comprises a layer of gallium nitride (GaN) and a layer of aluminum nitride (AlN), or a layer of gallium nitride (GaN) and layer of an alloy of aluminum nitride (Al_zX_yN).

38. The method of claim 26, further comprising flip chip mounting said first mirror layer, epitaxial semiconductor structure and substrate combination on a submount after depositing said first mirror, such that said first mirror layer is adjacent to said submount and said first mirror layer and eitaxial semiconductor structure is sandwiched between said submount and substrate.

39. The method of Claim 38, wherein said submount comprises one of the group consisting of monocrystaline silicon carbide (SiC), a silicon substrate and glass.

40. A resonant cavity light emitting diode (RCLED), comprising:

a thin film epitaxial semiconductor structure;

a fist mirror layer on one surface of said eptaxial semiconductor structure;

a second mirror layer on another surface of said epitaxial semiconductor structure such that said epitaxial semiconductor structure is sandwiched between said first and second mirrors, said second mirror layer being less reflective than said first mirror layer;

a submount, said epitaxial semiconductor structure with its said first and second mirrors mounted on said submount, said first mirror layer being adjacent to said submount and said second mirror layer being the primiary emitting surface.

41. The RCLED of claim 40, wherein said epitaxial semiconductor device emits light and has a thickness to provide a resonant cavity for said light.

42. The RCLED of claim 40, wherein said epitaxial semiconductor device comprises two layers of semiconductor material that are oppositely doped.

43. The RCLED of claim 40, wherein said epitaxial semiconductor device comprises and semiconductor active region sandwiched between two oppositely doped layers.

44. The RCLED of claim 40, wherein said either said first or second mirror layer comprise a metal.

45. The RCLED of claim 40, wherein said first or second mirror layers comprise a distributed Bragg reflector (DBR)

46. A method for removing a silicon carbide substrate from a Group-III nitride epitaxial semiconductor material, compising:

growing a Group-III nitride epitaxial semiconductor material on a silicon carbide substrate;

introducing an etch environment to said silicon carbide substrate, said etch environment etching silicon carbide faster than said Group-III nitride epitaxial material such that said etching substantially stops after said silicon carbide is etched off.

47. The method of Claim 46, wherein said etch environment comprises a reactive ion etch.

48. The method of Claim 46, wherein said etch environment comprises nitrogen trifluoride (NF_3). Reactive ion etch